



## Thermo Power Corporation

# Fast Response Isotopic Alpha Continuous Air Monitor (CAM)

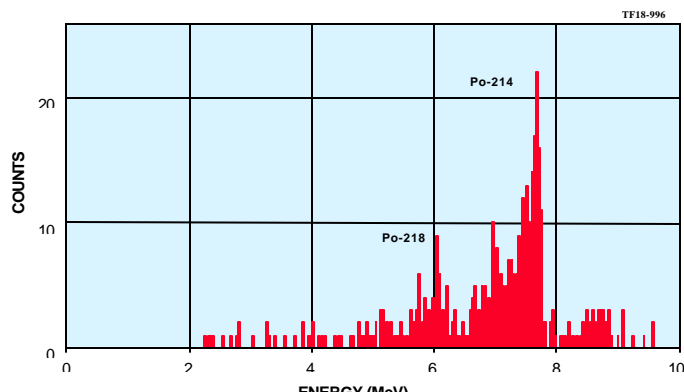
### Technology Need:

The United States Department of Energy (DOE) has an important need for Continuous Air Monitoring (CAM) of alpha-emitting radionuclides in order to meet environmental, health, and safety requirements for site workers and for the general public. Typical DOE operations that utilize CAM systems to ensure compliance with regulatory limits include decontamination and decommissioning (D&D), site remediation and waste management, weapons assembly/disassembly, and thermal treatment.

### Technology Description:

The Thermo Power Corporation (Tecogen Division) is developing and testing a novel Continuous Air Monitor (CAM) instrument for monitoring alpha-emitting radionuclides, using a technology that can be applied to Continuous Emission Monitoring (CEM) of thermal treatment system off gas streams. The CAM instrument will have very high alpha spectral resolution and provide real-time, on-line monitoring suitable for alerting workers of high concentrations of alpha-emitting radionuclides in the ambient air and for improved control of decontamination, dismantlement, and air emission control equipment.

The instrument will provide greatly improved data



reliability by eliminating the self-shielding associated with filter-based assay instruments, and excellent isotopic resolution will permit operation in areas with high background radon levels.

The technology involves a proprietary, patent-pending method of collecting and measuring airborne radioactive species. This allows for rapid quantification of the specific alpha-emitting species with a high-resolution solid-state silicon detector. Initial development of this technique involved a sub-scale laboratory device that was successfully demonstrated at Thermo Power.

This Proof-of-Principle testing isotopically resolved 0.02 pCi/l radon and thoron progeny in ambient air in a 10-minute sample/count cycle, a sensitivity already beyond the required 0.002 pCi/l of Plutonium-239 ( $^{239}\text{Pu}$ ) in 8 hours prescribed by DOE in 10CFR835. Further, testing of an integrated bread-board instrument has successfully verified the theoretical response functionality of the process. With all of the component technologies having been benchmarked, both separately and in combination, DOE's required CAM response time should easily be attained.

In addition to being applied to Continuous Emission Monitoring (CEM) of alpha emitters in thermal treatment system off gas streams, this new method can be modified to incorporate air or off gas analysis by conventional methods (i.e. x-ray fluorescence, laser-induced fluorescence, particle size distribution, etc.).

### Benefits:

<Automatic on-line operation

<Smooth surface improves isotopic resolution



---

<Improved operation in areas with high radon background levels

<High volumetric flow yielding high sensitivity

<Laboratory or field deployable

<Particle size distribution capability

<Integrated calibration

<Sample archiving system

<No delay in obtaining accurate analyses

### **Status and Accomplishments:**

This project was concluded in June 2001. It was in the base phase of a two phase developmental effort. This phase involved the design, development, and preliminary testing of a laboratory-scale instrument. If the Optional Phase II had been exercised, the Phase I instrument would have been critically evaluated at the Lovelace Respiratory Research Institute with characterized plutonium aerosols; then an improved instrument would have been constructed and subsequently field-tested at a suitable DOE site.

During February 2001, NETL was informed that Thermo Technologies, a subsidiary of Thermopower, was being eliminated. At this point, Thermo Power had completed the development of a first prototype and an advanced prototype unit, and were scheduled to perform a field demonstration under a Large Scale Demonstration and Deployment Project (LSDDP) during the summer of 2001.

Due to these developments, the alpha air monitor was transferred to the ESH group at Los Alamos National Laboratory (LANL), where they will use the instrument in everyday operation. No further development is planned. The alpha water monitor (TMS # 312) was also transferred to the radioactive liquid waste treatment facility at LANL for their use. The water monitor was developed with similar technology under a previous NETL contract with Thermo Power.

### **Contacts:**

Richard. P. Bush  
National Energy Technology Laboratory  
Phone: (412) 386-6426  
E-mail: [richard.bush@netl.doe.gov](mailto:richard.bush@netl.doe.gov)

### **Online Resources:**

Office of Science and Technology, Technology Management System (TMS), Tech ID # 2225  
<http://ost.em.doe.gov/tms>

The National Energy Technology Laboratory Internet address is <http://www.netl.doe.gov>